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Departmental Report No. 37

ADDRESS

OF

NORMAN J. COLMAN,

COMMISSIONER OF AGRICULTURE,

BEFORE THE

CONVENTION OF AGRICULTURAL COLLEGES AND EXPERIMENTAL STATIONS.

WASHINGTON, D. C., JULY 8, 1885.

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HON. NORMAN J. COLMAN,

Commissioner of Agriculture.

BEFORE THE CONVENTION OF AGRICULTURAL COLLEGES AND EXPERIMENTAL STATIONS, HELD AT WASHINGTON, D. C., JULY 8 AND 9, 1885.

GENTLEMEN OF THE AGRICULTURAL COLLEGE CONVENTION:

It was not without considerable hesitation that I assumed the responsibility of issuing a call for this convention. I thought I saw the necessity of the friends of agricultural colleges meeting together to take a reckoning, like the mariners at sea, as to their course and bearings, to ascertain whether they were satisfied with the progress that had been made and whether the haven of their hopes and expectations was likely to be reached. If, upon consultation, the journey thus far has been satisfactory there is no need of a change of course, but if, on the contrary, the progress has been slow and tedious, and has not come up to the reasonable expectations of its friends or the general public, anchor should be cast, a consultation had, the difficulties ascertained, and a new programme agreed upon.

But to drop the figure of nautical speech, I took the responsibility of issuing a call for this convention, believing there was an urgent necessity for it. To those who have responded to it, and have come from their distant college homes, and to all who are present, manifesting an interest in the cause of agricultural education, I extend not only my thanks for their attendance but a most cordial welcome.

It is not necessary for me to recur to the discussions that took place in Congress to secure the magnificent land grants to endow agricultural colleges in the respective States of this Union, or to revive the memory of the high expectations that were raised in regard to the important work they would perform in preparing young men for agricultural pursuits, and in maintaining in a healthful and growing condition the agricultural interests of our country.

It will be conceded that the general public profess a degree of disappointment in the outcome of these institutions. Although their proper title is that of agricultural and mechanical colleges, they are popularly alluded to as agricultural only; therefore the logical inference is that their duties are mainly directed to the special subject of agricultural education, teaching the science and art of farming and showing the practical application of scientific investigations in the raising of crops.

OBJECTS OF THE ENDOWMENTS.

The endowments granted by Congress for the support of these institutions were made for the purpose of educating young men as farmers, and also for instructing them in various mechanical pursuits. The predominant idea, however, was that of instructing young men in farming operations and in the fundamental principles of plant culture, so that they would learn how to realize profits in raising crops without diminishing the fertility of the soil. The arguments which influenced Congress to pass the land grants for the benefit of agricultural colleges were largely based upon submitted facts showing that the average yields of farming lands were gradually diminishing in quantity, and that the soil was rapidly being exhausted of plant food.

To arrest this somewhat alarming tendency towards spoliation of arable lands, it was deemed advisable to encourage institutions where the results of scientific investigations in vegetable physiology would be exemplified, and their practical application in fields and gardens so clearly illustrated to all who could happily avail themselves of this education that students would see it clearly demonstrated that the profits of farming were sufficiently great to direct more of the active energies of young men to the cultivation of the soil.

These were the intentions, but it is needless to observe that the results have not been commensurate with public expectations. Complaints have been made that comparatively few of the graduates from these colleges become farmers, that they adopt other professions, and that in some cases they have avoided rather than embraced the cultivation of farms as a vocation.

Without fully indorsing these views, we cannot ignore their existence, and to some extent admit their truth. Especially in cases where the maintenance of the farm is noted as a tax upon the funds of the college, it is not surprising that graduates should avoid a calling which has been demonstrated to them as unprofitable. I do not wish to dwell on this point, or to be understood as entertaining the belief that these remarks are applicable to all agricultural colleges at the present time, although it may have been a reasonable deduction in the earlier history of many of them, and may still be applicable to some. Be that as it may, I feel assured that we concur in the wish that all laudable means may be brought to their assistance which may advance their interests and enable them to realize the expectations of their founders.

ACQUIRING AGRICULTURAL KNOWLEDGE.

The first step in the acquisition of knowledge is a desire to know. Fortunately this desire is strongly impressed upon the minds of the race, and this natural aspiration has only to be encouraged, enticed by that which is pleasant and attractive and brought in connection with that which is proposed to be studied, and an interest in learning will be awakened as a natural consequence.

For instance: If every college farm had an ample fruit garden where varieties of the best strawberries, raspberries, and other small fruits were grown, all properly labeled so that the peculiarities of each would be exhibited, attention would be directed to the culture and value of these fruits. A small vineyard should also be made for a like purpose. Orchards of apples, pears, plums, cherries, &c., should be planted where they could be visited by students, so that they might familiarize themselves with the different varieties, and observe the methods of culture, pruning, &c., and at the same time receive instruction as to the reasons for particular manipulations at certain periods. The fruits as they mature should appear on their tables for consumption, so that the value of the different kinds could be practically and intelligently discussed. No one can doubt the usefulness of all this as presenting educational advantages of the most practical character.

TEACHING PRACTICAL FORESTRY.

Then again, forestry, so far as regards the details in the raising and management of forest trees, might well receive special attention from every agricultural college in the country. All operations connected with the culture of forest trees could be practiced and demonstrated, from the preparation of the ground, the sowing of the seeds, showing the proper depth of covering them, the time and method of transplanting, the necessary culture, the cutting down crooked or unsightly growing plants in order to produce straight and vigorous stems, pruning branches so as to maintain the kind of growth required, and other features of tree culture would form one of the most useful as it would be one of the most attractive factors of an educational institution; and this would be a matter of easy accomplishment, as easy in fact as that of sowing a crop of peas or producing a crop of corn. Neither would it greatly absorb either labor or land, although it might be well that the final plantings should be at the yearly rate of only an acre in extent.

For educational purposes it is essential that seeds of various trees should be sown annually. In due time the young plants will be transferred from the seed rows, some to nurseries, others to take their place at once in the young forest, which is to be of yearly extension, so as to illustrate to every new-comer the entire processes of tree culture from seed-growing upward.

The arrangement in final planting will provide for the gradual thinning out of the more rapid-growing species; these, it will be explained, are introduced to hasten the development of slow-growing kinds, and when the time comes for their removal it will be shown how these rapid-growing trees can be utilized for various manufacturing purposes.

In the course of a few years, after several acres have thus been planted, illustrating the annual rate of growth of each kind of tree, and presenting unequaled facilities for instruction in all the phases of tree-culture, such a series of forest growth would attract attention from far beyond the locality of the grounds so occupied.

It need not be considered out of place to note that as an investment this culture of timber would pay as well in many localities as any other crop that could be produced on the same quantity of land. Then, again, while practical forestry will be fully exhibited, opportunities will be presented for the increase of knowledge about trees. Among other matters about which but little is known, it may be mentioned that the period of growth when wood is of maximum value is an unanswered question.

AN ARBORETUM ON COLLEGE FARMS.

On every college farm a commencement should be made of planting an arboretum, which should ultimately contain at least one specimen plant of every tree and shrub capable of enduring the climate of the locality; trees from all parts of the world to be included, arranged in family groups, and accurately and conspicuously labeled. This systematic arrangement should be combined with the highest degree of adaptation to landscape effect and pleasure-ground adornment.

The utility of an arboretum is as obvious and important as that of any other museum of natural history. Unlike most other museum collections, this would constantly vary in its beauty and attractions—the annual development of individual growths, with all their wonderful combinations of forms, foliage, flowers, and fruits. The opening buds in spring and the varied hues of the foliage during autumn represent extreme periods, between which each day has its own peculiar attractions, affording a field of instruction which will largely tend to increase the desire to acquire knowledge of vegetable physiology, and furnish strong incentives to the pursuit of botanical studies.

HEDGES OR LIVE FENCES.

Practical instructions in planting and rearing live fences would, perhaps, lead to a better knowledge of the necessity of systematic management in order to maintain a good, useful hedge. Many losses have occurred and many dollars have been squandered in first planting a hedge and then neglecting it. The uses of hedges have not been exhausted, and a knowledge of how to produce them, and keep them in proper condition afterwards, would lead to their frequent introduction, more especially as ornamental adjuncts to rural embellishments, and for the shelter and protection they afford to fruits and vegetables. In this line experiments may profitably be made as to the best hedge plants for various sections of the country, different climates naturally suggesting different plants for this purpose.

EXPERIMENTAL WORK ON COLLEGE FARMS.

In conducting farming operations on college lands the idea has been entertained that the work should mainly be of an experimental character. While experiments, if fairly conducted, are always of some value, even when they teach us what to avoid, yet they should be considered as being distinct from the principal farm work, which should consist of the application of methods which are recognized as being essential to successful and profitable farming, so that the records of the cost and value of productions will show that farming is a profitable industry.

No opportunity, however, should be lost in introducing examples of processes known to be valuable, even if not generally adopted.

Underground draining, for instance, is a fundamental improvement in certain soils, and, wherever it is practicable to make the comparison, the benefits of underdraining should be shown; the best methods of performing the work; the respective merits of deep and shallow draining; the gradual amelioration of soils thus operated upon, and its effects on crops in regard to their early maturity and increased productiveness as contrasted with soils of similar quality similarly treated and similarly situated but which have not been drained. In farming, if in nothing else, example is more valuable than precept. In the fields ocular demonstration is at once the most silent and the most effective teacher.

These suggestions refer more particularly to matters which may be regarded as permanent accompaniments to every college farm, and so far as they come within the scope of this Department should receive its aid and support.

In regard to operations and plans which might be carried out on college farms by the faculty, and which would be more particularly under the auspices of this Department, and for its special use and advantage, I will merely mention some things which present themselves at this time, and which can be solved only by investigations carried on simultaneously in different localities, and others which require the climatic conditions of special localities as may be best for the particular crop or plants to be placed in cultivation.

CLIMATIC INFLUENCES ON PLANTS.

The peculiarities consequent upon changing seed from one soil and climate to other soils and climates are strongly suggestive that ultimate good would result from a well-conducted series of experiments made over widely diversified climates and conditions, in accordance with preconceived plans, and conducted systematically and co-operatively.

It is well known that climate has very perceptible influences upon the habits of plants; also that these peculiarities are transmitted with a greater or less degree of permanency to their progeny.

The length of time required to establish a particular habit, say of earliness or lateness, so that its recurrence may be looked for with certainty, has not been a subject upon which there is much of recorded observation. Enough is known, however, to warrant experiment in this direction. We all know that crops are influenced by the soil and climate which produced the seeds from which they are grown; but how far this influence extends or how far it may be subservient to the increase, the period of maturity, or otherwise add to the intrinsic value of crops are problems concerning which we have no definite knowledge.

This is a point of inquiry which will require several years of concerted observation before it can be answered. The wider the system of interchange of seeds, and the greater the number of simultaneous tests, the sooner can we produce tabulated results from which we can deduce principles for our guidance and future action.

ROTATION OF CROPS.

The principles governing the rotation of crops do not seem yet to be fully explained. Of course it is well known that it is a factor of success in the general cultivation of crops. In ancient times, when land became unproductive it was supposed that it required rest, hence the practice of fallowing was introduced. The Romans allowed the land to rest after each crop; a crop and a year's fallow succeeding each other.

It was a very natural deduction that the land required rest when it was found, after successive crops of the same plant, it refused to grow, although the land had not apparently diminished in fertility.

I need not enter into the details of the reasonings which physiologists advance in explanation of the necessity of rotating crops; various theories have been offered, most of them referring it to the depletion of some ingredient required by the plant, which ingredient, if not exhausted in fact, is not in a condition to be available as plant food, but which, in the case of frequent stirrings of the soil, would become liberated or brought into a soluble state by action of the atmosphere in sufficient quantities to furnish a proper supply for another crop. And this was supposed to be accomplished by fallowing.

The idea has been entertained that chemical analysis would indicate the best line of practice to be followed in regard to the rotation of crops, or perhaps obviate the necessity of any change except that of convenience. This was to be effected by analysis of the soil and the plant to be grown in it, so that the ingredients removed by the latter could be replaced, and thus the fertility of the soil could be maintained for an indefinite period. But, so far, this knowledge has not been promulgated, neither the analysis of soils nor the analysis of plants furnishing the data seemingly necessary for practical purposes.

The phenomena attending the growth of certain crops for a series of years on the same soil apparently includes certain factors which are not readily explained. It is well known that nursery men, who pride themselves in maintaining a high standard of quality in their salable stock of pear, apple, peach, and other kinds of fruit trees. are careful not to attempt to grow two successive crops on the same land. Even after experimenting with all kinds and quantities of manures which their skill and experience can suggest, the quality of their stock will depreciate if grown a second time on the same soil unless long periods elapse between the rotations.

Even in the case of such humble plants as petunias and verbenas in the flower-beds, it is well known that they cease to give satisfaction when grown more than three years in the same place, notwithstanding the ground is well manured. These and facts of a similar kind might be assumed as an indication that there may be some as yet undiscovered cause that exerts an influence in plant nutrition.

The hypothesis has been advanced that plants excrete injurious matters by their roots, which exert a baneful influence upon future crops of the same plants, but may furnish nutritious matter for plants of a different species; this has also been given as a reason for the benefits which follow a rotation of crops.

It has also been stated that growers have found that a crop of tomatoes which follows a crop of water-melons will show increased productiveness from that circumstance alone. Similarly it has been asserted that the best strawberry crops are those taken from land which produced potatoes as a previous crop. Statements of this kind are not usually and generally made by farmers or gardeners without some basis of fact, and it would seem to be a matter worthy of special observation.

Doubtless there is something yet to be learned on this subject of the rotation of crops, and as it is one of careful observation, rather than of extra skill or large expenditures in making experiments, it is all the more worthy of attention.

EXPERIMENTS WITH THE COTTON PLANT.

As an example of special work for certain suitable localities I would mention investigations relating to the cotton plant.

It is of course well known that there are numerous varieties of cotton under cultivation, each kind possessing peculiarities more or less marked, either in the quality of the fiber, vitality of the plant, especially during uncongenial seasons, or in its prolific qualities and periods of maturity. The exact specific value of any one variety in comparison with other varieties has not, I venture to say, been fully tested as to different localities.

This department, after having collected seeds of as many distinct varieties as could be found, can assign them to colleges in all the cotton growing States, with instructions, such as to plant them side by side, and to give them precisely similar treatment throughout their growth, and, as often as semi-weekly, carefully to note every detail of the progress of the young plants in connection with rainfall, temperature, &c., time of first flowering, continuation of the blooming period, quantity and quality of lint, with other observations which would be deemed essential in arriving at a just estimate of their respective values.

This would require to be continued for a series of years, but, when completed, could not fail in being of much benefit to all persons engaged in the culture of this crop. Determinations would be reached as to the adaptability of certain kinds to certain climates; better varieties than those now cultivated would be indicated for many localities, and thus the profits of the planter would be increased.

The fact which would be evolved by these experiments would be the first step towards the higher development of the cotton plant, as it elicits the preliminary knowledge necessary to the intelligent crossing of varieties for the purpose of combining in one the excellencies of many others, which cannot be done until at least the approximate value of each variety entering into the experiments has been determined.

IMPROVED VARIETIES BY HYBRIDIZATION.

Plant hybridizing is a subject which requires a keen knowledge of the best lines of progress for the improvement of vegetable products; then the time for, and the performance of, the delicate manipulations necessary in most cases of transferring pollen from one plant to another requires judgment and dexterity. These, however, are obstacles not difficult to overcome, and when we reflect upon the vast possibilities pertaining to, and resulting from, proper systems of hybridization, it becomes a matter of surprise that the process is not more of a common practice than it is.

Most of our improved fruits are merely selections from the common variations of seedling plants, and but few of them can be traced to special hybridizations, so that we may infer that this great highway to improvement has hardly yet been entered upon. There is not a more promising field in which agricultural colleges can distinguish themselves than in developing in this way new and improved varieties of all kinds of fruits, cereals, and other vegetables, and thus obtain varieties better adapted to the locality and more profitable to the agriculturist.

I do not propose to make a list of all the subjects deserving our cooperative attention. I could not do so even if vain enough to attempt the task, but I will allude to one other subject which concerns us all, and that is the diseases of plants.

Where attempts have been made to trace a disease to its origin we find opinions conflicting to a degree apparently irreconcilable. This undoubtedly partly arises from the almost infinite modifications of the various agents which influence plants and which render it extremely improbable that any single observation can be universally correct.

There is scarcely any natural phenomena which may not be explained in various ways, according as they are traced to their primary, secondary, intermediate, or ultimate causes, and as far as it goes each explanation may be equally correct. But this latitude of explanation is a source of much perplexity to the uninitiated who cannot perceive that they may all proceed from the same general principles.

Observations and conclusions published upon the origin and causes of diseases in plants are valuable or otherwise, according to the knowledge of vegetable economy possessed by those who favor us with their opinions.

I am aware that in studying plant ailments it is extremely difficult in many cases to decide between a cause and a consequence. This has led to serious mistakes, as, for instance, a recent recommendation to cut down, " stamp out," peach trees, otherwise the fungus growth known as leaf blister, which is seen on peach trees occasionally during the period of leafing, would spread and destroy all the peach trees in the country. This, like most other destructive fungi on plants, being a consequence of diseased leaves caused by unfavorable climatic conditions, could not be " stamped out " permanently unless peach culture should be abandoned, because, supposing that all existing peach trees were destroyed, the first one afterwards planted would be as liable to leaf blister as its predecessors.

The low forms of vegetable and animal growth sometimes, if not always, present in diseased plants must not be taken as certain proof that they are the cause of the disease, the probabilities being that they are present in consequence of diseased organisms.

It is well known that the profitable culture of some of our best fruits is rendered very problematical on account of their liability to fatal diseases. The pear blight is an example. Many apparently conflicting opinions have been published from time to time in regard to the cause of this malady; some attributing it to fungi, and others to bacteria, but withal, no remedy is suggested by microscopists so far as I am aware. It has been repeatedly stated that the mere covering of a branch with ordinary lime-wash will entirely exempt the part so covered from attack by blight. This is one of those cases where tests made on agricultural college grounds would become authoritative, and, if of value, would be widely published, and if found to be of no value, the result would be equally conclusive in showing its inutility.

Then again we have the serious question of grape mildew, which is really the cause of so much perplexity in the culture of this fruit, and gives rise to so many conflicting opinions regarding the value of varieties in different sections and localities. Only the kinds most resistant of mildew can be cultivated profitably over a large portion of the country. Many, if not all, of the finest fruiting and best flavored varieties are subject to mildew on the foliage, unless they are grown in localities where there is but little dewfall. No application to the soil, so far as is known, and no systems of pruning, or any kind of manipulation, as applied to the plant have any effect in warding off this malady.

Expedients which have for their object preventing the radiation of heat from the leaves have been found a certain preventive of mildew; a board covering the trellis has been found efficient, so also grape vines growing on trees are not much injured by mildew. This again leads to the conclusion that elevated localities which are wholly or partially exempt from dews would be genial to the grape and such is found to be the fact. Recorded observations on these subjects would lead to the number of "ascertained facts."

Millions upon millions of dollars are lost annually by the ravages of blights, molds, rusts, smuts, and other vegetable diseases, and agricultural colleges can do a noble work in determining their causes and prescribing remedies.

These suggestions and hints are made in the spirit that we are all mutually interested in the furtherance of a common object. Suggestions are apt in the very nature of the case to be mistaken for dictations. Neither do I undertake to prescribe limits to agricultural education, or say how it can differ or be distinguished from what is ordinarily given.

KNOWLEDGE NEEDED BY THE AGRICULTURIST.

The agriculturist, above most other persons, must possess a greatly diversified knowledge in order to exercise a proper judgment or approach to uniformity of success in his various operations. He must be conversant with the principles of cultivation; and before he can perceive the *rationale* of his labors he must have a knowledge of the laws—the definite and unvarying principles—of physical science, so far as ascertainable. The field of study thus becomes one of immense magnitude.

How plants grow, how and upon what they feed, why some are fruitful while others are barren, the exact specific relations which exist between them and the soil in which they are growing, and the different developments evolved by the unequal distribution of the elements of growth, are the subject-matter of physiology—a science which comprehends a knowledge of chemistry, botany, and the general principles of natural philosophy. The constituent elements of soils, their numerous combinations, and the sources from which they have been produced, involve the study of mineralogy and geology.

Economy of labor depends upon the skillful application of the laws of mechanics. A knowledge of the laws or principles of hydrostatics and hydraulics is necessary before the farmer can fully understand the science of draining lands, or provide for its proper application or execution. To guard against attacks of insects, or repel those which have found a lodgment in his crops, involve some acquaintance with entomology, and the complicated influences of climate bring him in contact with meteorology and climatology. In short, there is no branch of knowledge that will not contribute to his aid, and may be productive of suggestions directly applicable to some of his varied pursuits.

Who, therefore, can decide as to what is and what is not included in agricultural education and its practical application to the cultivation of plants?

EXPERIMENTAL FARM WORK.

But it is needless to dwell further upon this line of thought. I have called attention to these topics that I might the more deeply impress upon your minds the value and the necessity of some such work on our agricultural college farms. In my judgment there is nothing which will attract and rivet the attention of the great agricultural public to our agricultural colleges so much as experimental work. Farmers will hope and expect to be benefited pecuniarily by work of this character conducted at the agricultural college farms in their respective States. On these should be tested every variety of fruit, cereals, grapes, timber trees, and even domestic animals; and those found in all respects adapted to the State should be disseminated by the college, and those not adapted should be discarded, although they might in some other State find a perfect adaptability, and be just what is most needed. In this way one college farm is trying experiments for hundreds of thousands of farmers who can enjoy the benefits and not suffer the losses in cost of labor and time of testing varieties, &c., some of which prove failures.

GREATER DIVERSITY OF CROPS.

In this connection I will state that this country, the best agricultural country in the world, possessing almost every variety of soil and climate, is to-day importing agricultural productions from abroad, and paying therefor tens upon tens of millions of dollars annually that could just as well be produced at home and the amount thus paid out be distributed among our toiling people. The surplus of productions in most branches of farm industry is creating such low prices for farm products that a fair compensation for their production is no longer received, and loss and suffering must ultimately ensue to the farming classes.

To the student of agriculture the necessity of a greater diversity of crops is yearly becoming more apparent, and the most inviting field that is presented is to produce such crops as our commercial needs demand from abroad, if they can be raised here, and I feel assured many of them can be, some in one part of the country and some in another. Here is a promising field for our agricultural college farms, one in which they can be of great use, and I proffer the full aid and sympathy of this Department in obtaining from any nation the seeds or plants of any product that we are now importing if, in the opinion of any of the agricultural colleges, such product would find a congenial home on the farm of such institution. I expect to make such arrangements with our diplomatic and consular service as will enable me to secure all desirable plants and seeds from abroad.

TEXTILE FIBERS IMPORTED.

The textile and other fibers imported, instead of diminishing with advances in agriculture and population, are rapidly increasing. In 1860 less than 8 tons of flax tow was imported and about 2,300 tons of hemp and 23,279 tons of jute and other fibers, the whole valued at little more than $2,000,000.

In 1870 the flax fiber was increased to 1,927 tons and the hemp to 22,557 tons. The value of these unmanufactured fibers exceeded $6,000,000. In addition raw silk was introduced to the amount of 82,442,918 pounds, valued at $3,139,024.

In 1879 nearly 3,000,000 pounds of cotton were imported, three to four millions in subsequent years, and in 1884 7,000,000 pounds. With flax, hemp, jute, &c., the imports of 1879 exceeded in value $7,000,000. In 1880 and 1881 over ten millions annually, and for three years past about $13,000,000. The statement for three years past is as follows, as kindly furnished me by Col. W. F. Switzler, the chief of the Bureau of Statistics:

	1882.		1883.		1884.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Cotton	4, 339, 952	$789, 844	4, 081, 945	$800, 532	7, 019, 492	$1, 379, 850
Flax	5, 563	1, 502, 645	5, 748	1, 621, 839	5, 086	1, 410, 578
Hemp	36, 679	6, 110, 152	29, 063	4, 927, 269	25, 925	4. 227, 876
Jute, &c	84, 186	4, 710, 192	125, 318	5, 994, 429	96, 471	5, 055, 853
Coir	1, 277	5, 538	111	470	17, 304	56, 979
Istle	1, 382	196, 517	356	33, 723	339	37, 832
Total	....	13, 314, 888	....	13, 378, 262	....	12, 168, 968

The importation of raw silk has increased immensely. The quantity imported last year was 3,222,546 pounds, valued at foreign ports of shipment at $12,481,496. Thus the original cost of all unmanufactured fibers, the raw material of manufactures, amounts to about $25,000,000, and with freight charges and possible undervaluations not much less than $30,000,000 annually.

FRUITS AND PLANTS FROM RUSSIA.

Perhaps it is not out of place to state here that I have already commissioned Mr. Leo. Weltz, of Wilmington, Ohio, a well known and intelligent nurseryman and fruit grower, with peculiar qualifications for this mission, to collect for this Department from the great Steppes of Russia such varieties of all kinds of fruit trees as he may believe will be perfectly hardy and find a natural home in the great Northwest; also to secure such seeds of grasses, timber-trees, and such shrubs and other plants as he thinks may be of value to that section.

As is well known the climate of the Northwestern States is so severe that scarcely a variety of any of our fruit trees is exempt from destruction, while on the Steppes of Russia, in fully as severe a climate, scores of varieties of apples, pears, cherries, plums, and even apricots, are uninjured and produce large annual crops of fruit. These plants and seeds, when received by the Department, will, in large proportion, be distributed to the agricultural colleges in the States directly interested in them.

Mr. Weltz, intending to visit this country, this Department, at a very small cost, will be enabled, it is hoped, to secure varieties of fruit and timber-trees and other plants that may be of almost inestimable value to that growing section of our country. I state this simply as an instance of what this Department will at all times be glad to do under my administration, if funds will admit, and likewise to show what instruments of good the agricultural college farms of the various States may become.

But the agricultural colleges need not depend solely upon this Department to carry on such experimental work. There should be enterprise enough among their friends and conductors to carry on the most important experiments for the welfare of their people. I know many of them are doing this already—most of them, in fact. All are doing a noble work, but a greater work is needed, and must be accomplished. I recognize the fact how limited are their means for this character of work, and I think appropriations by Congress should be made for special work of this character. Nothing would be of greater importance to such colleges, or to the agricultural classes of the various States.

SIGNAL SERVICE IN AGRICULTURAL COLLEGES.

The practical utilization in agriculture of discoveries in meteorological science is an urgent necessity of the present time. The fact will not be disputed that too little has as yet been accomplished in this direction. There have been advances in meteorology, but its practical benefits have inured more to the advantage of commerce than of agriculture.

A partial system of observation was established in 1819, conducted by the surgeons at military posts, at the suggestion of Surgeon-General Lovell. In 1825 a system was established by the New York legislature, requiring teachers of academies that were recipients of the educational fund to take three observations daily. Pennsylvania, Massachusetts, and other States afterwards entered upon similar observations.

In 1849 the Smithsonian Institution commenced its work of observation for the study of winter storms, for the collection of statistics illustrating the climate of North America, the average local temperatures and variations at different periods of the year. The dependence of agriculture upon meteorology became a prominent thought in the mind of Professor Henry, who commenced a series of annual reports upon agricultural meteorology, which were published in each volume of the agricultural reports of the Patent Office from 1855 to 1859, inclusive. In 1863, by arrangement between the Smithsonian Institution and the Department of Agriculture, the returns of observers were tabulated in the Department, and the results were published in both its monthly and annual reports from 1863 to 1870, inclusive.

Upon the accession of Judge Watts as Commissioner of Agriculture, this publication was discontinued, and the returns declined, in opposition to the judgment of the Secretary of the Smithsonian Institution, who was compelled to make a new arrangement for their tabulation and publication, which was ultimately made with the Signal Service.

I deem it a misfortune that the design of the scientific institution n which the system originated was not carried to its ultimate beneficent results, as foreshadowed by the able preliminary work of Professor Henry. The inquiry may properly be suggested, in view of the great practical questions of agricultural meteorology to be solved, and the momentous importance of the industry to be benefited, whether Congress should not assign to the Department of Agriculture, in co-operation with the agricultural colleges, so much of the work of the Signal Service as pertains to agricultural meteorology. This suggestion should be promptly and wisely considered, the details of the plan of work agreed upon, and the action of Congress invoked at a very early day.

Members of Congress, especially those representing agricultural constituencies, will readily see the utility of a more practical agricultural meteorology, and they will appreciate the necessity of placing such investigation in the hands of professors of agriculture in our institutions of industrial learning, with the co-operation of the Department of Agriculture. They can, and doubtless will, with alacrity and liberality, provide means to render efficient and valuable the investigations so desirable and promising in this direction. It is hoped that the discussions of this subject here will demonstrate conclusively the practicability and necessity of the plan proposed.

So far as this Department is concerned it will co-operate most heartily, most thoroughly with the agricultural colleges and experiment stations of the respective States of this nation. This convention was called for the purpose of forming a bond of union and of sympathy between this Department and the agricultural colleges of the country, and while under existing appropriations and usages it may not be able to do what its Commissioner might desire to have done, yet, year by year, it is hoped the way will be opened to do still more in this direction, making the agricultural colleges of the country the experimental grounds of this Department, testing everything that may prove of value to the farmer, and finally distributing the seed and plants after a thorough test to the farmers of the respective States in which the colleges are located.

It is true I can see the propriety of having a national experimental farm at the seat of Government, conducted by this Department, collecting from the four quarters of the globe everything that would be likely to be of value to our agriculture, testing, propagating, and distributing from this central national experimental farm to all sections of the country what would likely be of most value to the agriculturists of these sections and, if I could go still further, I would have erected on that farm, which should be near the capital, a great permanent national or world's exposition, where the products of this country and of all nations might be shown side by side, that the people of this and of all nations might visit the capital city, and see not only the productions of America but of all the nations of the earth.

I believe the day is coming when that which I now mention will be realized, for agriculture is the nursing mother of all our industries, and is entitled to such recognition, and in this exposition would bring with her her handmaids—manufactures and commerce.